



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/573,862	10/24/2006	Georg Stefan Dusberg	1406/334	7026
25297 7590 12/31/2008 JENKINS, WILSON, TAYLOR & HUNT, P. A. Suite 1200 UNIVERSITY TOWER 3100 TOWER BLVD., DURHAM, NC 27707				
EXAMINER				
CHU, CHRIS C				
ART UNIT		PAPER NUMBER		
2815				
MAIL DATE		DELIVERY MODE		
12/31/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/573,862

Applicant(s)

DUSBERG ET AL.

Examiner

CHRIS C. CHU

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 October 2008.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 29 is/are pending in the application.
4a) Of the above claim(s) 15 - 29 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1 - 4, 6, 7, 11, 12 and 14 is/are rejected.
7) ☒ Claim(s) 5, 8 - 10 and 13 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB-08)
Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on October 6, 2008 has been received and entered in the case.

Election/Restrictions

2. This application contains claims 15 – 29 drawn to an invention nonelected without traverse in the reply filed on May 5, 2008. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claims 1 – 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
 - (A) In claim 1, line 6, the term "high" is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.
 - (B) Dependent claims 2 – 14 do not rectify the deficiency of claim 19 and therefore

are similarly rejected.

On page 2, applicant argues “examples of what would be considered a ‘high’ value (See specification ¶ [0047], 6000 W/mk). Therefore, it is respectfully submitted that one of ordinary skill in the art could understand the meaning of the term ‘high’ of claim 1 in light of the disclosure in the specification. Accordingly, Applicants respectfully submit that the § 112 rejection of claims 1 – 14 be withdrawn.” This argument is not persuasive because the specification clearly states on page 10, lines 20 – 23 “the **extremely high** thermal conductivity of carbon nanotubes, which is of the order of magnitude of **6000 W/mk**”. This statement is a clear evidence that the value “6000 W/mk” is not some standard for measuring the degree of the term “high”. In other words, the term “**extremely high**” is not same as the term “high”. Furthermore, the meaning of the term “high” depends on the unrestrained, subjective opinion of the person practicing the invention and applicant does not provide any specific range that is covered by the term “high”, hence the scope of the term is not understood. Therefore, the 35 U. S. C. § 112, second paragraph, rejection is proper.

For the above reasons, the rejection is maintained.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 6, 12 and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by Leal et al. (U. S. Pat. No. 6,838,776).

Regarding claim 1, Leal et al. discloses in e.g., Fig. 8 a packaging device (the device in e.g., Fig. 8) for packaging electronic circuit units, comprising:

- a) a packaging means (326 and 415), which surrounds the electronic circuit unit (200) and which is electrically insulating (column 6, lines 18 – 21 and see e.g., Fig. 8. Since the element 326 of the packaging (326 and 415) is electrically insulating and surrounding the chip 200, hence the packaging means of Leal et al. fully anticipates this limitation); and
- b) particles (the nano-particles within the element 415; column 6, lines 18 – 21 and column 3, lines 17 – 23) dispersed in the packaging means ((326 and 415)), said particles (the nano-particles) having a high thermal conductivity (column 6, lines 18 – 21 and column 3, lines 17 – 23), wherein
- c) the particles (the nano-particles within the element 415) dispersed in the packaging means (326 and 415) are formed as nanoelements (the nano-particles within the element 415).

Regarding claim 6, Leal et al. discloses in e.g., Fig. 8 the nanoelements (the nano-particles within the element 415) forming the dispersed particles (since the nano-particles are mixed with or separated by an insulating material, hence the nano-particles of Leal et al. read as dispersed particles) being functionalized in such a way that electrical conduction properties of the nanoelements are suppressed (since the nano-particles are mixed with or separated by an insulating material, hence the electrical conduction properties of the nano-particles of Leal et al.

are suppressed).

Regarding claim 12, Leal et al. discloses in e.g., Fig. 8 the nanoelements (the nano-particles within the element 415) forming the dispersed particles (since the nano-particles are mixed with or separated by an insulating material, hence the nano-particles of Leal et al. read as dispersed particles) having in their longitudinal axes extents which are significantly smaller than a thickness of the packaging means (see e.g., Fig. 8).

Regarding claim 14, this claim merely recite the intended use or the environment in which the semiconductor device of claim 1 is intended to be used. Since the claim fails to define any additional structure, Leal et al. anticipates this claim as well.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2 – 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leal et al. in view of Stoner et al. (U. S. Pat. No. 6,965,199).

Regarding claims 2 – 4 and 7, while Leal et al. discloses the use of the nanoelements forming the dispersed particles, Leal et al. does not disclose the nanoelements being nanotubes (claim 2), silicon nanowires (claim 3), carbon nanotubes (claim 4) and intrinsically doped in such a way that a metallic system is eliminated (claim 7). Stoner et al. teaches in e.g., column 1, lines 26 – 33 nanoelements (the nanoparticles; column 1, line 28) being nanotubes (column 1, line 29),

silicon nanowires (column 1, line 30), carbon nanotubes (column 1, line 29) and intrinsically doped (the Si) in such a way that a metallic system being eliminated (column 1, line 29). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to apply the carbon nanotubes and silicon nanowires of Stoner et al. to form the nanoelements of Leal et al. as taught by Stoner et al. to exhibit certain properties that have raised interest in a variety of application (column 1, lines 31 – 32).

9. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leal et al. in view of Tobita (U. S. Pat. No. 6,652,958).

While Leal et al. discloses the use of the nanoelements forming the dispersed particles, Leal et al. does not disclose the nanoelements being oriented with a longitudinal axis parallel to at least one heat flow which flows between the circuit unit and an outer side of the packaging device. Tobita teaches in e.g., Fig. 6 nanoelements (20 or carbon fiber; column 14, line 44) being oriented with a longitudinal axis parallel to at least one heat flow which flows between a circuit unit (12; column 10, line 38) and an outer side of a packaging device (see e.g., Figs. 1 and 6). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to apply the orientation of Tobita to form the parallel longitudinal axis of Leal et al. as taught by Tobita to produce a thermally conductive polymer sheet that is flexible and rubber-like and has a thickness of 1 mm (column 14, lines 41 – 43).

Allowable Subject Matter

10. Claims 5, 8 – 10 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the

base claim and any intervening claims.

- (A) Claim 5 contains allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of nanoelements forming the dispersed particles being provided with an electrically insulating sheathing layer.
- (B) Claim 8 contains allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of nanoelements forming the dispersed particles being provided as carbon nanotubes and being intrinsically doped with nitrogen and/or with boron in such a way that the metallic system is eliminated.
- (C) Claim 9 contains allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of nanoelements forming the dispersed particles being provided as hetero-nanotubes having a large band gap.
- (D) Since claims 10 and 13 are dependent claims of objected claims (claims 5 and 9), these claims are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims (e.g., claims 5 and 9).

Response to Arguments

11. Applicant's arguments filed on October 6, 2008 have been fully considered but they are not persuasive.

On page 3, applicant argues “ it is evident that the Leal disclosure does not anticipate the claimed invention because Leal discloses an electrically conductive encapsulant layer whereas the claimed invention is electrically insulating. Thus, it is respectfully submitted that claim 1 and its dependent claims 6, 12, and 14 are allowable over Leal.” This argument is not persuasive. Since applicant does not specifically claim that the packaging means is one single-uniform layer that is electrically insulating. A reasonable interpretation of the term “packaging means” includes the structure taught by Leal. In other words, the encapsulant layer 326 of the packaging means (326 and 415) of Leal et al. disclosed in e.g., Fig. 8 is electrically non-conductive layer (column 6, lines 18 – 21 and see e.g., Fig. 8.), hence the packaging means (326 and 415) of Leal et al. reads as an electrically insulating layer. Also, the sub-encapsulant layer 415 of the packaging means (326 and 415) of Leal et al. is an electrically conductive encapsulant layer does not make the packaging means (326 and 415) of Leal et al. not electrically insulating layer.

For the above reasons, the rejection is maintained.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHRIS C. CHU whose telephone number is (571)272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Chris C. Chu
Primary Examiner
Art Unit 2815

/Chris C. Chu/
Primary Examiner, Art Unit 2815
Tuesday, December 30, 2008